

Amendments to the Claims

The current listing of the claims replaces all previous amendments and listings of the claims.

1. (Currently Amended) An image processing apparatus comprising:
 - a memory which stores a plurality of first images obtained by photographing an object to be rendered from a plurality of different photographing directions, and second images that pertains to geometry information of the object to be rendered;
 - a geometrical shape model generation unit which generates a geometrical shape model of the object to be rendered on the basis of the second images;
 - a microfacet generation unit which generates a plurality of microfacets used to approximate a three-dimensional shape of the geometrical shape model;
 - a billboard processing unit which rotates the plurality of microfacets to make a predetermined angle with a view direction; and
 - a texture mapping unit which generates a third image associated with the object to be rendered in correspondence with the view direction by selecting texture images for respective microfacets from the plurality of first images on the basis of the plurality of photographing directions and view direction, and by projecting the selected texture images onto the microfacets.
2. (Original) An apparatus according to claim 1, wherein the geometrical shape model generation unit generates a plurality of voxels, and generates the geometrical shape model using the plurality of voxels, and
 - the microfacet generation unit generates the microfacets in the respective voxels.
3. (Original) An apparatus according to claim 2, wherein the geometrical shape model generation unit controls the number of voxels to be generated on the basis of precision of the second images.

4. (Original) An apparatus according to claim 2, further comprising a clipping processing unit which appends geometry information to each pixel of the plurality of first images on the basis of the second images, and executes a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and a distance from a viewpoint to each voxel.

5. (Original) An apparatus according to claim 1, further comprising an interpolated image generation unit which selects at least two first images in ascending order of angle that the view direction and the plurality of photographing directions make, and generates an interpolated image on the basis of the at least two first images, and

wherein the texture mapping unit selects the texture images for respective microfacets from the plurality of first images or the interpolated image on the basis of the plurality of photographing directions and view direction, and projects the selected texture images onto the microfacets.

6. (Original) An apparatus according to claim 5, further comprising a clipping processing unit which appends geometry information to each pixel of the plurality of first images and the interpolated image on the basis of the second images, and executes a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and the interpolated image, and a distance from a viewpoint to each voxel.

7. (Original) An apparatus according to claim 4, wherein the clipping processing unit comprises graphics hardware.

8. (Currently Amended) An image processing method for generating an image from a predetermined view direction in association with an object to be rendered, comprising:
generating a plurality of first images obtained by photographing the object to be rendered from a plurality of different directions, and second images that pertain to geometry information of the object to be rendered;

generating a geometrical shape model of the object to be rendered on the basis of the second images;

generating a plurality of microfacets used to approximate a three-dimensional shape of the geometrical shape model;

executing a billboarding process that rotates the plurality of microfacets to make a predetermined angle with a view direction; and

generating a third image by selecting texture images for respective microfacets from the plurality of first images on the basis of the plurality of photographing directions and view direction, and by projecting the selected texture images onto the microfacets.

9. (Original) A method according to claim 8, wherein the geometrical shape model is a voxel model formed of a plurality of voxels, and

the microfacets are generated for respective voxels.

10. (Original) A method according to claim 9, wherein the step of generating the geometrical shape mode includes the step of controlling the number of voxels to be generated on the basis of precision of the second images.

11. (Original) A method according to claim 9, further comprising appending geometry information to each pixel of the plurality of first images on the basis of the second images, and executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and a distance from a viewpoint to each voxel.

12. (Original) A method according to claim 8, further comprising selecting at least two first images in ascending order of angle that the view direction and the plurality of photographing directions make, and generating an interpolated image on the basis of the at least two first images, and

wherein in texture mapping, the texture images are selected for respective microfacets from the plurality of first images or the interpolated image on the basis of the plurality of photographing directions and view direction, and the selected texture images are projected onto the microfacets.

13. (Original) A method according to claim 12, further comprising appending geometry information to each pixel of the plurality of first images and the interpolated image on the basis of the second images, and executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and the interpolated image, and a distance from a viewpoint to each voxel.

14. (Currently Amended) A computer program-product comprising a computer storage medium configured to store program instructions for generating an image from a predetermined view direction in association with an object to be rendered using a plurality of first images obtained by photographing the object to be rendered from a plurality of different directions, and second images that pertains to geometry information of the object to be rendered, on a computer system enabling the computer system to perform functions of:

generating a geometrical shape model of the object to be rendered on the basis of the second images;

generating a plurality of microfacets used to approximate a three-dimensional shape of the geometrical shape model;

executing a billboard process that rotates the plurality of microfacets to make a predetermined angle with a view direction; and

generating the third image by selecting texture images for respective microfacets from the plurality of first images on the basis of the plurality of photographing directions and view direction, and by projecting the selected texture images onto the microfacets.

15. (Original) A computer program product according to claim 14, wherein the geometrical shape model generation function generates a plurality of voxels, and

generates the geometrical shape model using the plurality of voxels, and the microfacet generation function generates the microfacets in the respective voxels.

16. (Original) A computer program product according to claim 15, wherein the geometrical shape model generation function controls the number of voxels to be generated on the basis of precision of the second images.

17. (Original) A computer program product according to claim 15, enabling the computer system to further perform a function of appending geometry information to each pixel of the plurality of first images on the basis of the second images, and executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and a distance from a viewpoint to each voxel.

18. (Original) A computer program product according to claim 14, enabling the computer system to further perform a function of selecting at least two first images in ascending order of angle that the view direction and the plurality of photographing directions make, and of generating an interpolated image on the basis of the at least two first images, and

wherein the third image generation function selects the texture images for respective microfacets from the plurality of first images or the interpolated image on the basis of the plurality of photographing directions and view direction, and projects the selected texture images onto the microfacets.

19. (Original) A computer program product according to claim 18, enabling the computer system to further perform a function of appending geometry information to each pixel of the plurality of first images and the interpolated image on the basis of the second images, and executing a clipping process of the plurality of first images on the basis of the

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geometry information of each pixel of each first image and the interpolated image, and a distance from a viewpoint to each voxel.